Data Summary Report for Santa Susana Field Laboratory, Ventura County, California

Prepared for

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Executive Summary

This report summarizes the nature and extent of soil contamination within, or emanating from, the National Aeronautics and Space Administration (NASA) sites within the NASA-administered property at Santa Susana Field Laboratory (SSFL). SSFL is located approximately 29 miles northwest of downtown Los Angeles, California, in the southeast corner of Ventura County. SSFL occupies approximately 2,850 acres of hilly terrain, with approximately 1,100 feet of topographic relief near the crest of the Simi Hills. The site is divided into four administrative areas (Areas I, II, III, and IV) and includes undeveloped land both to the north and south. Area II is owned by the federal government; NASA administers both Area II and a portion of Area I. The primary site activities at the NASA administered areas of SSFL have included research, development, and testing of liquid-fueled rocket engines and associated components (MWH, 2009).

Included in this report is an evaluation of the data quality of analytical results for chemical analysis performed on soil samples collected and analyzed to provide site characterization data of contaminants at the NASA-administered sites at SSFL. Quality assurance/quality control procedures outlined in the *Quality Assurance Project Plan, SSFL RFI Surficial Media Operable Unit, Revisions 2, 4, and 5* (SSFL QAPP) (MEC_X, 2008; 2009; 2013) were evaluated to confirm the quality of field and laboratory data, and to confirm that project work meets the data quality objectives for the intended use of the data. Additionally, an assessment of whether the data meet the data quality objectives was conducted to demonstrate that a sufficient number of representative samples were collected, and the resulting analytical data can be used to support the decision-making process.

The overall completeness was met, and no systematic protocol errors were identified during the monitoring of the field or laboratory efforts. The overall quality of the analytical program and laboratory are sufficient to meet the project data quality objectives.

The nature and extent of soil contamination at 16 NASA-administered areas at SSFL have been evaluated from 3,734 surface soil and 1,860 subsurface soil samples, 43 sediment samples, and 744 soil vapor samples dating from 1983 through 2014. The 16 NASA-administered areas include the following:

- Alfa/Bravo Fuel Farm (ABFF)
- Propellant Load Facility (PLF)
- Coca/Delta Fuel Farm (CDFF)
- Ash Pile (AP)/Sewage Treatment Plant (STP)
- Building 204 Area
- Storable Propellant Area (SPA)
- Skyline Road Area
- Alfa Area
- Bravo Area
- Liquid Oxygen (LOX) Plant
- Area II Landfill
- Expendable Launch Vehicle (ELV)
- Coca Area
- Delta Area
- R-2 Ponds
- Hazardous Waste Storage Area (HWSA) Waste Coolant Tank (WCT).

Historical sampling results were used to generate preliminary remediation areas (PRAs) and the PRAs were used to identify data gaps for additional sampling. The sampling proposed to fill the identified data gaps was documented in six field sampling plans that were approved by the Department of Toxic Substances Control (DTSC). Sampling results were used to evaluate final remediation areas (FRAs).

Based on the results of the data evaluation and conclusions for the NASA-administered areas, no further investigations are recommended to evaluate the extent of contamination at any of the sites, with exception of the following:

- SPA – Additional sampling is recommended around the areas of SPA-1 and SPA-2 for vertical evaluation of formaldehyde. These samples will be collected as part of the confirmation sampling effort.
- Coca Area - Additional sampling is recommended to evaluate PCBs around transformers in the Coca Area. These samples will be collected as part of the confirmation sampling effort.

Additionally, based on comments provided by DTSC on the Field Sampling Plan 6 (FSP-6), further sampling is recommended during the confirmation sampling effort at each site. The proposed confirmation sampling will be based on site-specific data and evaluation and will be included in a confirmation sampling plan under a separate deliverable specific for each site.

Acronyms and Abbreviations

µg/kg	microgram(s) per kilogram
µg/m^3	micrograms per cubic meter
^{134}Cs	cesium-134
^{137}Cs	cesium-137
^{152}Eu	europium-152
^{154}Eu	europium-154
^{226}Ra	radium-226
^{228}Ra	radium-228
^{228}Th	thorium-228
^{22}Na	sodium-22
^{232}Th	thorium-232
$^{235/236}U$	uranium-235/236
^{235}U	uranium-235
^{238}U	uranium-238
^{241}Am	americium-241
3-D	three dimensional
^{3}H	tritium
^{40}K	potassium-40
^{54}Mn	manganese-54
^{60}Co	cobalt-60
^{90}Sr	strontium-90
A&S	Aging and Surveillance
A2LF	Area II Landfill
ABFF	Alfa/Bravo Fuel Farm
ABSP	Alfa/Bravo Skim Pond
AOC	Area of Concern
AP	Ash Pile
ARCL	Aroclor
AST	aboveground storage tank
BEHP	bis(2-ethylhexyl)phthalate
bgs	below ground surface
Boeing	The Boeing Company
BTEX	benzene, toluene, ethylbenzene, and xylenes
CDFF	Coca/Delta Fuel Farm
COC	chemical of concern
CTL	Component Test Laboratory
CUA	Chemical Use Area
D&D	Demilitarization and Disposal
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DIOX	dioxin
DIOXTEQ	dioxin toxic equivalence quotient
DNBP	di-n-butyl phthalate
DNOP	di-n-octyl phthalate
DOE	U.S. Department of Energy
DQO	data quality objective

DRO	diesel range organics
DTSC	Department of Toxic Substances Control
EFH	extractable fuel hydrocarbons
ELV	Expendable Launch Vehicle
EPA	U.S. Environmental Protection Agency
FRA	final remediation area
FSP	*Field Sampling Plan*
GN2	gaseous nitrogen
GRO	gasoline-range organic
GS	soil gas
GWTU	groundwater extraction/treatment unit
HWSA	Hazardous Waste Storage Area
IRFNA	inhibited red fuming nitric acid
JP	jet propellant
LEOS	Laser and Electro-Optical System
LH2	liquid hydrogen
LOX	liquid oxygen
LUT	Look-up Table
MDL	method detection limit
MEK	methyl ethyl ketone
mg/kg	milligrams per kilogram
NASA	National Aeronautics and Space Administration
NDMA	n-nitrosodimethylamine
NED	National Elevation Dataset
NRHP	National Register of Historic Places
ORO	oil-range organic
PAH	polycyclic aromatic hydrocarbon
PAHTEQ	polycyclic aromatic hydrocarbon toxic equivalence quotient
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PCB	polychlorinated biphenyl
PCB_CON	polychlorinated biphenyl congeners
PCB_COPL	polychlorinated biphenyl coplanars
PCE	tetrachloroethene
pg/g	picogram per gram
PLF	Propellant Load Facility
PRA	preliminary remediation area
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	remedial investigation
RI WP	Remedial Investigation Work Plan
RJ	ramjet
RL	reporting limit
RP	rocket propellant
SO	subsurface soil sample
SPA	Storable Propellant Area
SS	surface soil sample
SSFL	Santa Susana Field Laboratory
SSME	Space Shuttle Main Engine
STP	Sewage Treatment Plant

SVOC	semivolatile organic compound
SWMU	solid waste management unit
TCA	trichloroethane
TCE	trichloroethene
TMB	trimethylbenzene
TPH	total petroleum hydrocarbons
UDMH	unsymmetrical dimethylhydrazine
USEFF	Universal Space Engine Flow Facility
UST	underground storage tank
UV/H_2O_2	ultra-violet/hydrogen peroxide
VCEHD	Ventura County Environmental Health Department
VOC	volatile organic compound
VSI	visual site inspection
WCT	Waste Coolant Tank